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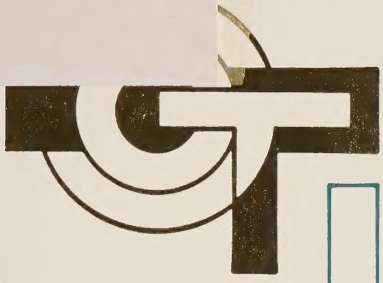

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# MEASURE C GROWTH MANAGEMENT ELEMENT TRAFFIC STUDY

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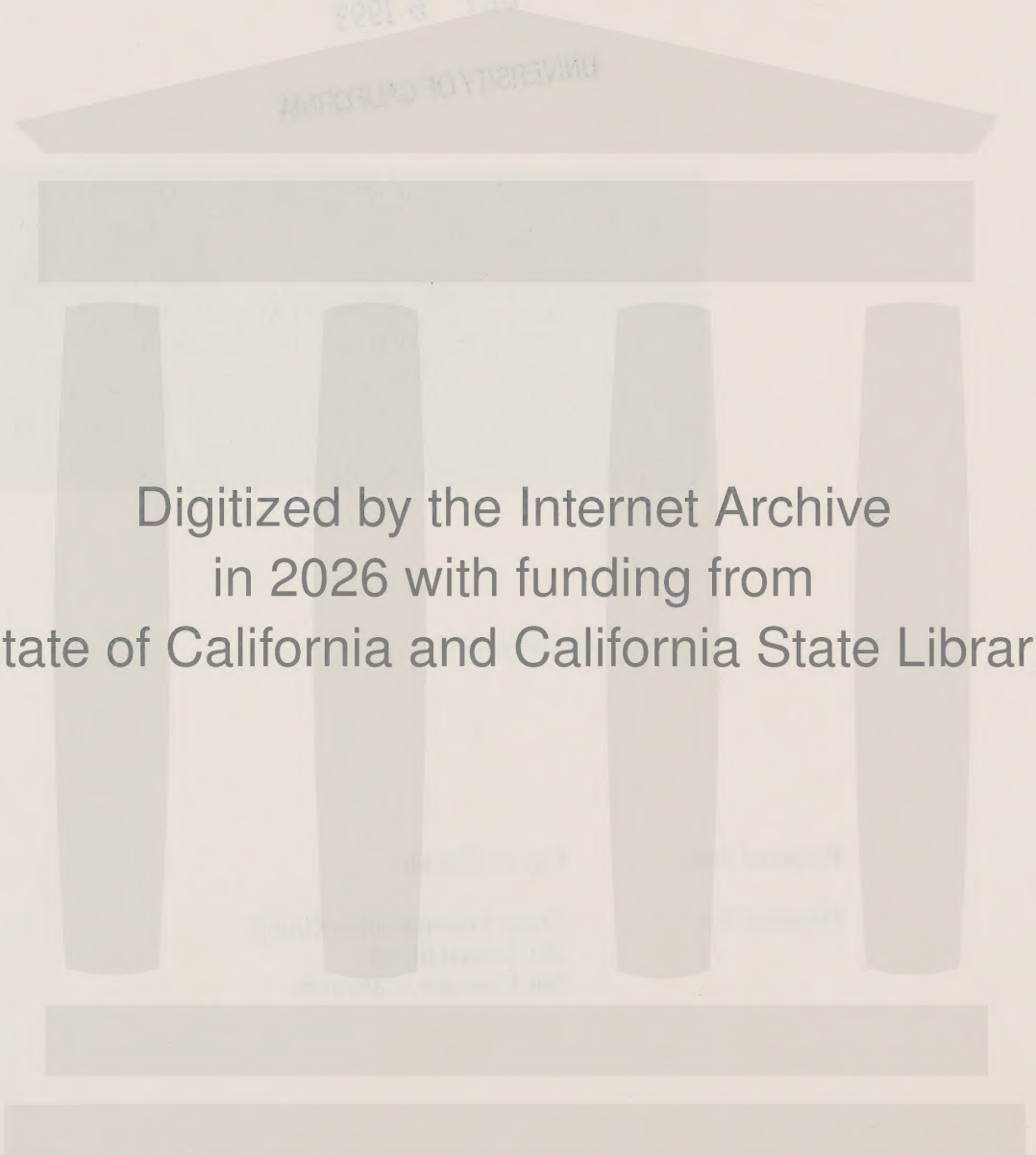
# MEASURE C GROWTH MANAGEMENT ELEMENT TRAFFIC STUDY

February, 1993

Prepared For: City of Clayton

Prepared By: Crane Transportation Group
300 Taraval Street
San Francisco, California



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CITY OF CLAYTON

MEASURE C GROWTH MANAGEMENT ELEMENT TRAFFIC STUDY

## I. INTRODUCTION

This study has been prepared by the Crane Transportation Group (CTG) at the request of the City of Clayton to provide the traffic and roadway information necessary for the City to participate in the Contra Costa Growth Management Program. It includes 1) a summary of findings; 2) a background of the Growth Management Program along with a listing of the City's final level of service designations for the major intersections in the community; 3) a listing of the City's final list of intersections to be studied; 4) existing circulation system conditions including 1992 AM and PM peak hour traffic count results at eight major intersections in the City; 5) future traffic projections on the citywide roadway system [projections have been made for the years 2000 and 2010 due to development within Clayton as well as due to the growth in traffic traveling through Clayton from development in other sections of the County]; 6) AM and PM peak hour level of service for eight major intersections in the City for existing, year 2000 and year 2010 conditions; 7) a listing of needed improvements at all intersections in order to provide acceptable AM and PM peak hour operation for all analysis years.

## II. SUMMARY OF FINDINGS

1. Currently, all eight analyzed intersections within the City of Clayton along Marsh Creek Road, Clayton Road, Oakhurst Drive and Mitchell Canyon Road are operating at good levels of service (Level A conditions) during both the morning and late afternoon commute traffic periods.

2. All analyzed intersections should be operating at good to acceptable levels of service (Level A or B) during both peak commute traffic periods with projected year 2000 and 2010 volumes.

3. No geometric improvements are projected to be needed at any analyzed intersection to accommodate existing, year 2000 or year 2010 peak volumes.

4. Signalization should not be warranted based upon standard traffic engineering criteria by 2010 at either of the two unsignalized intersections analyzed for this study: Marsh Creek Road/Diablo Parkway and Mitchell Canyon Road/Pine Hollow Road.

## III. BACKGROUND OF THE GROWTH MANAGEMENT PROGRAM

The Contra Costa County Growth Management Program was funded by a countywide bond measure passed in 1988, commonly referred to as Measure C. This measure created a 1/2 percent sales tax for the purpose of funding transportation planning and improvements in the cities and unincorporated areas of Contra Costa County. It requires that each jurisdiction establish a Growth Management Element which will be incorporated into the jurisdiction General Plan.

Measure C projects include construction of highway and arterial road improvements, and extension of the Bay Area Rapid Transit system (BART). Program elements include a variety of transit services and regional transportation planning and growth management. Measure C funds are to be allocated to jurisdictions

participating in the Growth Management Program established by Measure C. All jurisdictions participating in the Program are required to select major intersections to be monitored for impacts relating to future traffic growth, to adopt traffic level of service standards for these intersections, and to work with the County Transportation Authority to develop programs for Routes of Regional Significance, which include all freeways and designated major arterials. Like other provisions of the Measure C program, the emphasis of the traffic service policy is on establishing a structure for sound land use and transportation planning.

To be eligible for Measure C funds, the Growth Management Program requires each participating city to take a number of actions, including:

- Establishing a commitment to manage congestion by adopting and applying traffic service standards on streets, roads and regional routes.
- Reducing dependency on the single-occupancy automobile through programs that include an alternative mitigation program in areas that have smaller employers or are primarily residential.
- Anticipating needed investments by adopting a five-year Capital Improvement Program that lists projects, their costs and funding mechanisms.
- Ensuring that new development "pays its own way" through mitigation fee programs.

Measure C also requires that each jurisdiction in the County adopt a Growth Management Plan, which is to include intersection traffic level of service (LOS) standards along routes "not of regional significance" keyed to land use types as follows:

| Land Use | (LOS) Level of Service | Volume/Capacity (V/C) Ratio |
|---|---|---|
| "Rural" | Low C | .70 - .74 |
| "Semi-Rural" | High C | .75 - .79 |
| "Suburban" | Los D | .80 - .84 |
| "Urban" | High D | .85 - .89 |
| "Central Business District" | Low E | .90 - .94 |

Based on these categories, each jurisdiction is required to determine how the traffic service standards are to be applied to their General Plan Land Use and Circulation Elements, and how land areas are to be defined under the land use categories listed above.

On December 19, 1989, the Clayton City Council adopted a resolution to apply interim Level of Service standards to City streets. These interim designations were made for specific roadways, and were not tied to land uses as required by Measure C.

## IV. SELECTION OF MAJOR INTERSECTIONS TO BE MONITORED FOR MEASURE C IMPACT

City staff, in consultation with the Crane Transportation Group, selected eight major intersections within Clayton to be monitored as part of the Measure C reporting criteria. These intersections, along with their related Level of Service standards, are as follows:

| Intersection | Adjacent Land use | Poorest Acceptable Operation |
|---|---|---|
| Clayton Road/Washington Boulevard | Urban | LOS High D |
| Clayton Road/Mitchell Canyon Road | Suburban | LOS Low D |
| Clayton Road/Marsh Creek Road (north) | Suburban | LOS Low D |
| Clayton Road/Oakhurst Drive | Suburban | LOS Low D |
| Clayton Road/Marsh Creek Road (south) | Suburban | LOS High C |
| Marsh Creek Road/Diablo Parkway | Semi-Rural | LOS High C |
| Oakhurst Drive/Eagle Peak Avenue (north) | Suburban | LOS Low D |
| Mitchell Canyon Road/Pine Hollow Drive | Suburban | LOS Low D |

## V. EXISTING CIRCULATION SYSTEM CONDITIONS

### A. EXISTING ROADWAYS

Access to the Clayton area is provided by Ygnacio Valley Road, Kirker Pass Road, Clayton Road, and Marsh Creek Road. Ygnacio Valley Road provides the shortest and most direct route to Walnut Creek, I-680 (southbound), and State Route 24. Northeast of Clayton Road, Ygnacio Valley Road becomes Kirker Pass Road and this roadway continues for approximately six miles to the northeast to the City of Pittsburg. Clayton Road extends in a northwest-southeast direction between the cities of Clayton and Concord. It provides Concord and Clayton residents with access to State Route 242 just north of I-680. Marsh Creek Road extends in a southeasterly direction from central Clayton to State Route 4 in the Byron-Brentwood area. Roadways serving the City of Clayton area are shown in Figure 1.

Because Clayton is primarily a commuter city, having relatively minor amounts of employment or shopping opportunities at present, growth in Clayton means an increase in commuter trips leaving the community. Most of the commuter trips enter and exit the City by three major access routes to the west: Clayton Road, Oakhurst Drive-Concord Boulevard and Pine Hollow Road.

Clayton Road in the project area serves as the primary access to Clayton from areas to the west and north. It has two travel lanes in each direction, a raised median and turn lanes at major intersections. The posted speed limit is 35 miles per hour (mph) from Kirker Pass Road to Mitchell Canyon Road, and 25 mph in the town center area. Between El Camino Drive and Mitchell Canyon Road, the road has bicycle lanes in both directions. There are signalized intersections on Clayton Road at Ygnacio Valley Road, Washington Boulevard, Mitchell Canyon Road, Marsh Creek Road (north), Oakhurst Drive and Marsh Creek Road (south) where it ends, as shown on Figure 1.

Concord Boulevard-Oakhurst Drive is a four-lane road that currently extends northward from Clayton Road to Kirker Pass Road. North of Kirker Pass Road, Concord Boulevard has two lanes and extends through Concord eventually intersecting with Clayton Road near State Route 242. In Clayton, Concord Boulevard has been renamed Oakhurst Drive. Concord Boulevard-Oakhurst Drive has traffic signal controls at Kirker Pass Road, Eagle Peak Avenue (both the north and south intersections), Indianhead Way and Clayton Road.

Pine Hollow Road is a two-lane roadway that connects Alberta Way with Mitchell Canyon Road. This roadway provides an alternate access into Clayton from Ygnacio Valley Road.

Marsh Creek Road extends from downtown Clayton to Byron in eastern Contra Costa County. In central Clayton, it is a two-lane road with turn lanes at some side-street intersections. It has sidewalks, curbs and gutters in areas where new development has occurred, but has unimproved shoulders on other segments. The posted speed limit is 25 mph.

From the new Clayton Road (south) intersection to Regency Drive, Marsh Creek Road is a four-lane road with a raised median and turn lanes at major intersections with a posted speed limit of 35 mph. South of Regency, Marsh Creek Road has two southbound lanes and one northbound lane. South of Diablo Parkway, the road narrows to a rural, two-lane road and the posted speed limit increases to 45 mph for southbound traffic, while remaining 35 mph for northbound traffic.

Mitchell Canyon Road is a two-lane roadway that connects Clayton Road with the north end of Mt. Diablo State Park. It is signal controlled at Clayton Road.

## B. EXISTING VOLUMES

Figures 1 and 2 show existing AM and PM peak period traffic volumes. Traffic counts were conducted by CTG staff at intersections along Clayton and Marsh Creek roads, Oakhurst Drive and Pine Hollow Road during March and April, 1991 and again in March and April, 1992 after the opening of Clayton Road between Oakhurst Drive and Marsh Creek Road (south). Two-way 1992 AM and PM peak hour volumes along Marsh Creek Road just southeast of Diablo Parkway are about 550 and 535 vehicles per hour (VPH), respectively, while in the center of town, Clayton Road just northwest of Oakhurst Drive has two-way AM and PM peak hour traffic volumes of 610 and 505 VPH, respectively. At the north end of town, the two-way AM and PM peak hour volumes on Oakhurst Drive just north of Eagle Peak Avenue (north) are 330 and 370 VPH, respectively, while Clayton Road just northwest of Washington Boulevard has volumes of 1,590 and 1,780 VPH, respectively. The two-way AM and PM peak hour volumes along Pine Hollow Road at the westernmost access to the City are 325 and 320 VPH, respectively. Existing volumes show that during the AM and PM peak traffic hours, Clayton Road carries about 70 percent of the total traffic accessing the City from the north, east and west, with Oakhurst Drive and Pine Hollow Drive each carrying about 15 percent.

## VI. FUTURE CIRCULATION SYSTEM CONDITIONS

### A. SURVEY ZONES, PROJECTED TRIP GENERATION, AND FUTURE TRAFFIC DISTRIBUTION

The City Planning Department was consulted to determine the number of new residential units as well as other types of development likely to occur for the year 2000 and 2010 planning horizons. Crane Transportation Group established traffic analysis zones throughout the City to identify the locations of local area growth that would impact City roadways. Figure 3 illustrates the survey zones while Tables 1 and 2 show the anticipated new land uses and expected trip generation within each zone for the 1992 to 2000 and 2001 to 2010 planning horizon increments, respectively. As shown in Table 1, by the year 2000 there will be 1,298 new residential units, a middle school with a capacity of 800 students, and a new clubhouse and restaurant at the City golf course. New residential units are expected to generate about 865 two-way AM peak hour trips and 1,115 two-way PM peak hour trips, while the new middle school is expected to generate about 185 two-way AM peak hour trips and 15 two-way PM peak hour trips. The expansion of facilities at the golf club should generate about an additional 35 two-way AM peak hour trips and 110 two-way PM peak hour trips.

Table 2 shows new development anticipated in Clayton from 2001 to 2010. As shown, 89 new multi-family units, 328 new single-family homes, a new 110,000 square foot shopping center in the center of town, and a 3,750 square foot convenience store at the south end of town are projected to be built during this time period. New residential units are expected to generate about 295 two-way AM peak hour trips and 395 two-way PM peak hour trips, while the new shopping center in the middle of town would be expected to generate about 175 two-way AM peak hour trips and 700 two-way PM peak hour trips.

Clayton development trip distribution was determined based upon traffic patterns documented in a previous traffic study (DKS, 1987), as adjusted by CTG field observations of current traffic movements now that all major roadway improvements, such as the Clayton Road extension to Marsh Creek Road (south), have been completed. In general, traffic distribution patterns for the 1992 to 2000 planning horizon residential development are anticipated to be similar to existing patterns because there will be no major land use type changes within Clayton to influence peak hour traffic patterns. However, within the 2001 to 2010 planning horizon, the new shopping center to be built in downtown Clayton will substantially influence traffic patterns in the downtown area and should eliminate many shopping trips that are now leaving the community..

### B. TRAFFIC INCREASES DUE TO CITY OF CLAYTON GROWTH FOR THE 1992 TO 2000 PLANNING HORIZON

Figures 4 and 5 show that due to development within Clayton from 1992 to 2000, the two-way AM and PM peak hour traffic volume increases along Marsh Creek Road (east of Diablo Parkway) would be 100 and 130 VPH, respectively, while in the center of town Clayton Road just northwest of Oakhurst Drive would have two-way AM and PM peak hour volume increases of 230 and 250 VPH, respectively. At the north end of town, 1992 to 2000 Clayton development AM and PM peak hour volume increases on Oakhurst Drive (north of Eagle Peak Avenue) would be 485 and 625 VPH, respectively, while Clayton Road just northwest of Washington Boulevard would have AM and PM peak hour two-way volume increases of 160 and 185 VPH, respectively. Pine Hollow Road west of Mitchell Canyon Road would have two-way AM and PM peak hour volume increments of 30 and 30 VPH, respectively.

## C. TRAFFIC INCREASES DUE TO GROWTH IN THROUGH TRAFFIC FOR THE 1992 TO 2000 PLANNING HORIZON

Figures 4 and 5 show that within the 1992 to 2000 planning period, two-way AM and PM peak hour volume increases along Marsh Creek Road (southeast of Diablo Parkway) due to through traffic from outside the City would be 195 and 170 VPH, respectively. At the north end of town, Clayton Road just northwest of Washington Boulevard would have two-way AM and PM peak hour volume increases of 115 and 105 VPH, respectively, while Oakhurst Drive just north of Eagle Peak Avenue would have two-way AM and PM peak hour volume increases of 60 and 45 VPH, respectively. Through traffic increases have been determined based upon interpolation of the most recent year 2000 and 2010 subregional traffic modeling runs that include the Clayton area.[1] However, a significant amount of interpolation was required as total volume projections for 2000 and 2010 for Marsh Creek Road, the road with the most through traffic, were less than existing volumes in many cases. It should be noted, though, that even if the through traffic increase increments utilized in this report for 2000 and 2010 conditions were doubled, overall significance of impacts and needed mitigations would still be the same as detailed in sections VII and VIII of this report.

## D. TRAFFIC INCREASES DUE TO CITY OF CLAYTON GROWTH FROM 2001 TO 2010

Figures 6 and 7 show AM and PM traffic volume increments from growth projected to occur within Clayton between 2001 and 2010. The two-way AM and PM peak hour volume increments from this growth along Marsh Creek Road (southeast of Diablo Parkway) would be 220 and 290 VPH, respectively, while in the center of town, Clayton Road just northwest of Oakhurst Drive would have two-way AM and PM traffic volume increments of 140 and 245 VPH, respectively. At the north end of town, the two-way AM and PM peak hour volume increments on Oakhurst Drive just north of Eagle Peak Avenue would be 60 and 45 VPH, respectively, while Clayton Road just northwest of Washington Boulevard would have two-way AM and PM peak hour volume increments of 150 and 165 VPH, respectively. Pine Hollow Road west of Mitchell Canyon Road would have two-way AM and PM peak hour volume increments of 30 and 30 VPH, respectively.

## E. TRAFFIC INCREASES DUE TO THROUGH TRAFFIC FROM MARSH CREEK ROAD FROM 2001 TO 2010

Figures 6 and 7 show the year 2001 to 2010 increment of AM and PM peak hour through traffic distributed to the citywide roadway system. Two-way AM and PM peak hour volume increases on Marsh Creek Road (southeast of Diablo Parkway) due to through traffic from outside the City would be 195 and 170 VPH, respectively. At the north end of town, Clayton Road just northwest of Washington Boulevard would have two-way AM and PM peak hour volume increases of 115 and 105 VPH, respectively, while Oakhurst Drive just north of Eagle Peak Avenue would have two-way AM and PM peak hour volume increases of 60 and 45 VPH, respectively. Through traffic increases have been determined based upon interpolation of the most recent 2010 subregional traffic modeling runs that have included the Clayton area.[2]

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[1]DKS Associates, October, 1992.

[2]DKS Associates, October, 1992.

## F. TOTAL TRAFFIC WITH EXISTING, THROUGH AND CLAYTON GROWTH VOLUMES FOR THE YEAR 2000 AND 2010 HORIZONS

Figures 8 and 9 show AM and PM peak hour total volumes for existing, through and Clayton growth traffic for the year 2000 and 2010 horizon planning horizons, respectively. Two-way AM and PM peak hour total volumes on Marsh Creek Road southeast of Diablo Parkway for the year 2000 horizon would be 845 and 835 VPH, respectively, while for the year 2010 horizon the two-way AM and PM peak hour total volumes would be 1,245 and 1,295 VPH, respectively. At the north end of town, Clayton Road just northwest of Washington Boulevard would have two-way AM and PM peak hour total volumes for the year 2000 horizon of 1,855 and 2,070 VPH, respectively, while for the year 2010 horizon the two-way AM and PM peak hour total volumes would be 2,120 and 2,340 VPH, respectively. Oakhurst Drive just north of Eagle Peak Avenue would have year 2000 horizon two-way AM and PM peak hour total volumes of 875 and 1,040 VPH, respectively, while for the year 2010 horizon the two-way AM and PM peak hour total volumes would be 995 and 1,130 VPH, respectively.

## VII. LEVEL OF SERVICE ANALYSIS

When the peak hour demand level of traffic is compared to the capacity of a road, the resulting operating condition or level of congestion is measured by a grading system called Level of Service (LOS). LOS grades may represent operating conditions at intersections or at mid-block points between intersections. However, intersections, rather than roadway segments between intersections, are almost always the capacity-controlling locations for a circulation system. LOS grades range from Level A, indicating uncongested flow and minimum delay to drivers, down to Level F, indicating extreme congestion and delay. At signalized and all-way stop intersections, the LOS grade applies to the entire intersection. At side-street, stop-sign controlled intersections, the LOS grade typically applies only to specific turning movements. However, at City staff request, both signalized and unsignalized intersections have been analyzed based upon Contra Costa County's Measure C level of service software for signalized intersections which utilizes the Intersection Capacity Utilization (ICU) analysis methodology. The ICU methodology reports results in a level of service format as well as a volume-to-capacity (V/C) format. The relationship between LOS and V/C ratio is detailed in Appendix A.

Tables 3 and 4 present existing, year 2000 and year 2010 intersection level of service results for AM peak hour and PM peak hour conditions, respectively, assuming existing intersection geometrics remain in place. As can be seen, all intersections are currently operating at good levels of service (LOS A) and are projected to remain operating at good to acceptable levels of service (LOS A or B) during both peak time periods with both year 2000 and 2010 traffic volumes. By the year 2000 only the Washington Boulevard/Clayton Road intersection would be experiencing operation poorer than LOS A: Level of Service B operation would be experienced during the PM peak hour. By the year 2010 all intersections would still be maintaining LOS A operation during both peak traffic periods with the exception of Washington Boulevard/Clayton Road, which would be operating at LOS B during both morning and afternoon commute periods, and Clayton Road/Mitchell Canyon Road, which would be operating at LOS B during the PM peak traffic hour.

It should be noted that for analysis purposes both the unsignalized Mitchell Canyon Road/Pine Hollow Road and Marsh Creek Road/Diablo Parkway intersections have been analyzed as if signalized (per instructions from City staff). Based exclusively on future volume projections, however, neither intersection would warrant signalization by the year 2010, based upon Caltrans peak hour signal warrant criteria (Warrant 11 - see Appendix A).

## VIII. NEEDED IMPROVEMENTS

Based upon intersection level of service analysis, none of the major intersections in Clayton analyzed in this report along Marsh Creek Road, Oakhurst Drive, Clayton Road or Mitchell Canyon Road will require improvements for existing, year 2000 or year 2010 conditions. As reported in section VII, neither the Mitchell Canyon Road/Pine Hollow Road or the Marsh Creek Road/Diablo Parkway intersections would have year 2010 volumes exceeding Caltrans peak hour signal warrant criteria levels.

TABLE 1

CITY OF CLAYTON DEVELOPMENT TRIP GENERATION
1992-2000 TIME PERIOD INCREMENT

| ZONE[1] | NUMBER AND TYPE OF UNITS[2] | DAILY TWO-WAY TRIPS | | AM PEAK HOUR TRIPS | | | | PM PEAK HOUR TRIPS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | IN | | OUT | | IN | | OUT | |
| | | RATE | VOL | RATE | VOL | RATE | VOL | RATE | VOL | RATE | VOL |
| 247 | 20 MF | 6.47 | 130 | .09 | 2 | .42 | 9 | .43 | 9 | .20 | 4 |
| 249 | 108 SF<br>372 MF | 9.55<br>6.47 | 1,040<br>2,410 | .19<br>.09 | 25<br>35 | .55<br>.42 | 60<br>160 | .66<br>.43 | 75<br>160 | .35<br>.20 | 40<br>75 |
| 251 | 399 SF<br>136 MF | 9.55<br>6.47 | 3,820<br>880 | .19<br>.09 | 80<br>13 | .55<br>.42 | 220<br>60 | .66<br>.43 | 265<br>60 | .35<br>.29 | 140<br>30 |
| 252 | 142 SF | 9.55 | 1,360 | .19 | 30 | .55 | 80 | .66 | 95 | .35 | 50 |
| 253 | 49 MF | 6.47 | 320 | .09 | 5 | .42 | 25 | .43 | 25 | .20 | 10 |
| 256 | 50 SF | 9.55 | 500 | .19 | 10 | .55 | 30 | .66 | 35 | .35 | 18 |
| 257 | 6 SF | 9.55 | 60 | .19 | 2 | .55 | 4 | .66 | 4 | .35 | 3 |
| 259 | 16 SF | 9.55 | 160 | .19 | 4 | .55 | 9 | .66 | 22 | .35 | 6 |
| TOTAL | 1,298 | | 10,680 | | 206 | | 657 | | 739 | | 376 |
| Middle School | 800 Students | 1.09 | 880 | .14 | 112 | .09 | 72 | .003 | 3 | .012 | 10 |
| Golf Club and Restaurant | | | | | 25 | | 10 | | 45 | | 65 |

Trip Rate Source: *Trip Generation*, 5th edition, by the Institute of Transportation Engineers, 1991.
Development Level Source: City of Clayton Planning Department, December, 1992

[1]Please see Figure 3 for zone map.
[2]MF = Multi-family SF = Single-family

TABLE 2

CITY OF CLAYTON DEVELOPMENT TRIP GENERATION
2001 TO 2010 TIME PERIOD INCREMENT

| ZONE* | NUMBER AND TYPE OF UNITS** | DAILY | | AM PEAK HOUR | | | | PM PEAK HOUR | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | IN | | OUT | | IN | | OUT | |
| | | RATE | VOL | RATE | VOL | RATE | VOL | RATE | VOL | RATE | VOL |
| 250 | 50 MF | 6.47 | 330 | .09 | 5 | .42 | 21 | .43 | 22 | .20 | 10 |
| 253 | 39 MF | 6.47 | 260 | .09 | 4 | .42 | 17 | .43 | 17 | .20 | 8 |
| 257 | 4 SF | 9.55 | 40 | .19 | 1 | .55 | 3 | .66 | 3 | .35 | 2 |
| 256 and 259 | 324 SF (Marsh Creek) | 9.55 | 3,100 | .19 | 65 | .55 | 180 | .66 | 215 | .35 | 115 |
| TOTAL RESIDENTIAL | 417 | | 3,730 | | 75 | | 221 | | 257 | | 135 |
| 250 | 110,000 SF Shopping Center | *3 | 7,500 | *4 | 110 | *2 | 65 | *5 | 350 | *3 | 350 |
| 256 | 3750 SF Convenience Store | *6 | N/A | 15.51 | 60 | 15.51 | 60 | 16.94 | 65 | 17.63 | 70 |
| | | | | | | | | | | | |

* Please see Figure 3 for zone map.
** MF = Multi-family SF = Single-family

Trip Rate Source: *Trip Generation*, 5th edition, by the Institute of Transportation Engineers, 1991.
Development Level Source: City of Clayton Planning Department, December 1992.

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[3]Ln(T) = .625 Ln(X) + 5.9859
[4]Ln(T) = .589 Ln(X) + 2.378 (63% in and 37% out)
[5]Ln(T) = .637 Ln(X) + 3.553 (50% in and 50% out)
[6]There is no daily rate provided by ITE.

T = Trips
X = Size in 1,000 square feet
Ln = Natural Log

TABLE 3

LEVEL OF SERVICE
AM PEAK HOUR

| INTERSECTION | EXISTING | YEAR 2000 | YEAR 2010 |
|---|---|---|---|
| Clayton Road/Marsh Creek Road (north) | A - .34[1] | A - .41 | A - .48 |
| Clayton Road/Marsh Creek Road (south) | A - .16 | A - .29 | A - .39 |
| Clayton Road/Diablo Parkway | A - .25 | A - .37 | A - .57 |
| Clayton Road/Oakhurst Drive | A - .18 | A - .31 | A - .41 |
| Washington Boulevard/Clayton Road | A - .45 | A - .54 | B - .61 |
| Clayton Road/Mitchell Canyon Road | A - .40 | A - .48 | A - .54 |
| Mitchell Canyon Road/Pine Hollow Road | A - .22 | A - .26 | A - .28 |
| Eagle Peak North/Oakhurst Drive | A - .09 | A - .25 | A - .28 |

Source: Crane Transportation Group

[1]Signalized level of service - volume/capacity ratio (Measure C software LOS methodology)

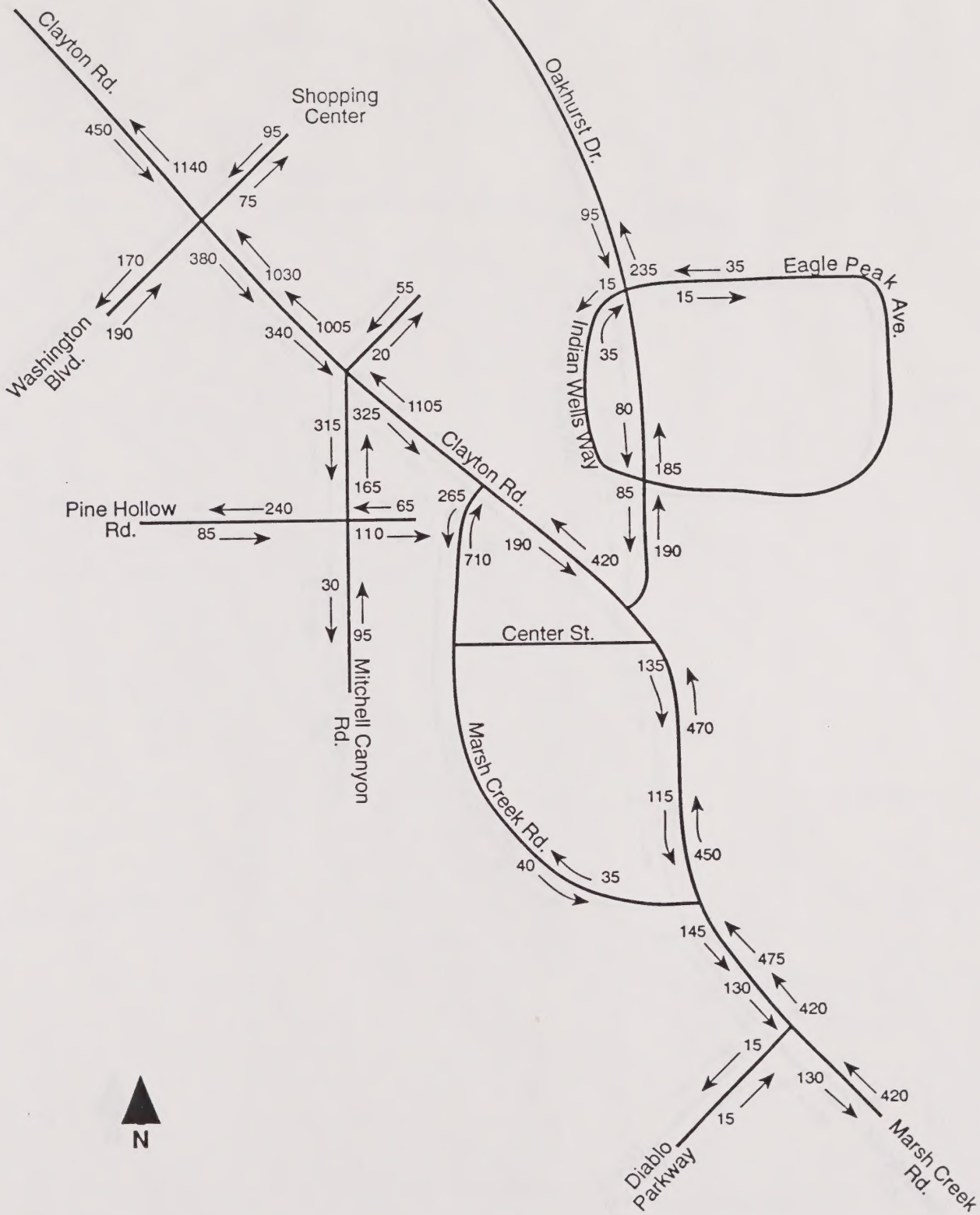
TABLE 4

LEVEL OF SERVICE
PM PEAK HOUR

| INTERSECTION | EXISTING | YEAR 2000 | YEAR 2010 |
|---|---|---|---|
| Clayton Road/Marsh Creek Road (north) | A - .31[1] | A - .33 | A - .35 |
| Clayton Road/Marsh Creek Road (south) | A - .18 | A - .25 | A - .37 |
| Clayton Road/Diablo Parkway | A - .12 | A - .17 | A - .31 |
| Clayton Road/Oakhurst Drive | A - .10 | A - .27 | A - .58 |
| Washington Boulevard/Clayton Road | A - .60 | B - .65 | B - .69 |
| Clayton Road/Mitchell Canyon Road | A - .44 | A - .54 | B - .65 |
| Mitchell Canyon Road/Pine Hollow Road | A - .22 | A - .25 | A - .28 |
| Eagle Peak North/Oakhurst Drive | A - .08 | A - .21 | A - .23 |

Source: Crane Transportation Group

[1]Signalized level of service - volume/capacity ratio (Measure C software LOS methodology)

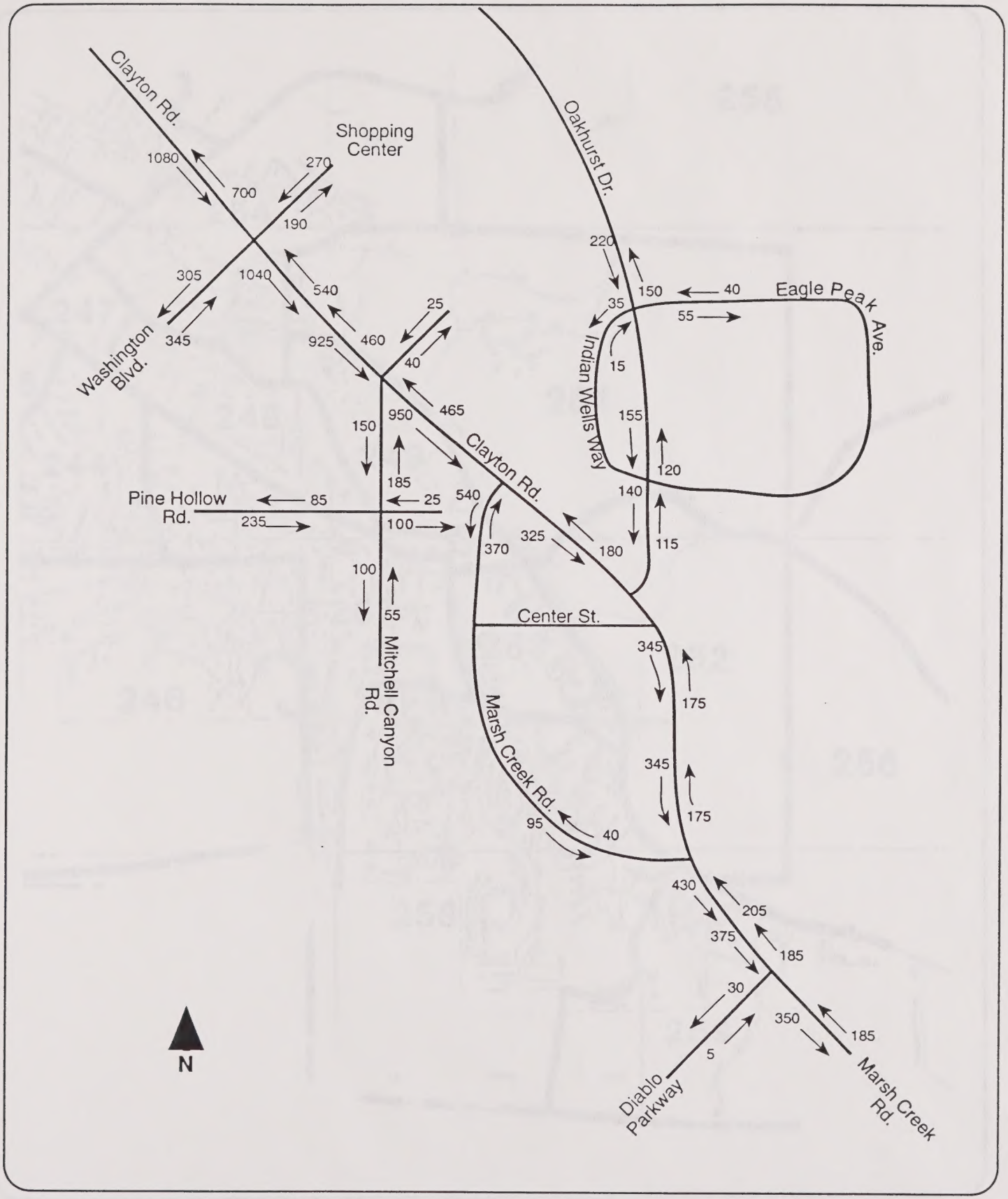



## Figure 1

**Existing AM Peak Hour Volumes**
**1992**

CRANE TRANSPORTATION GROUP

City of Clayton Measure "C" Traffic Study




## Figure 2

**Existing PM Peak Hour Volumes**
**1992**

CRANE TRANSPORTATION GROUP

City of Clayton Measure "C" Traffic Study

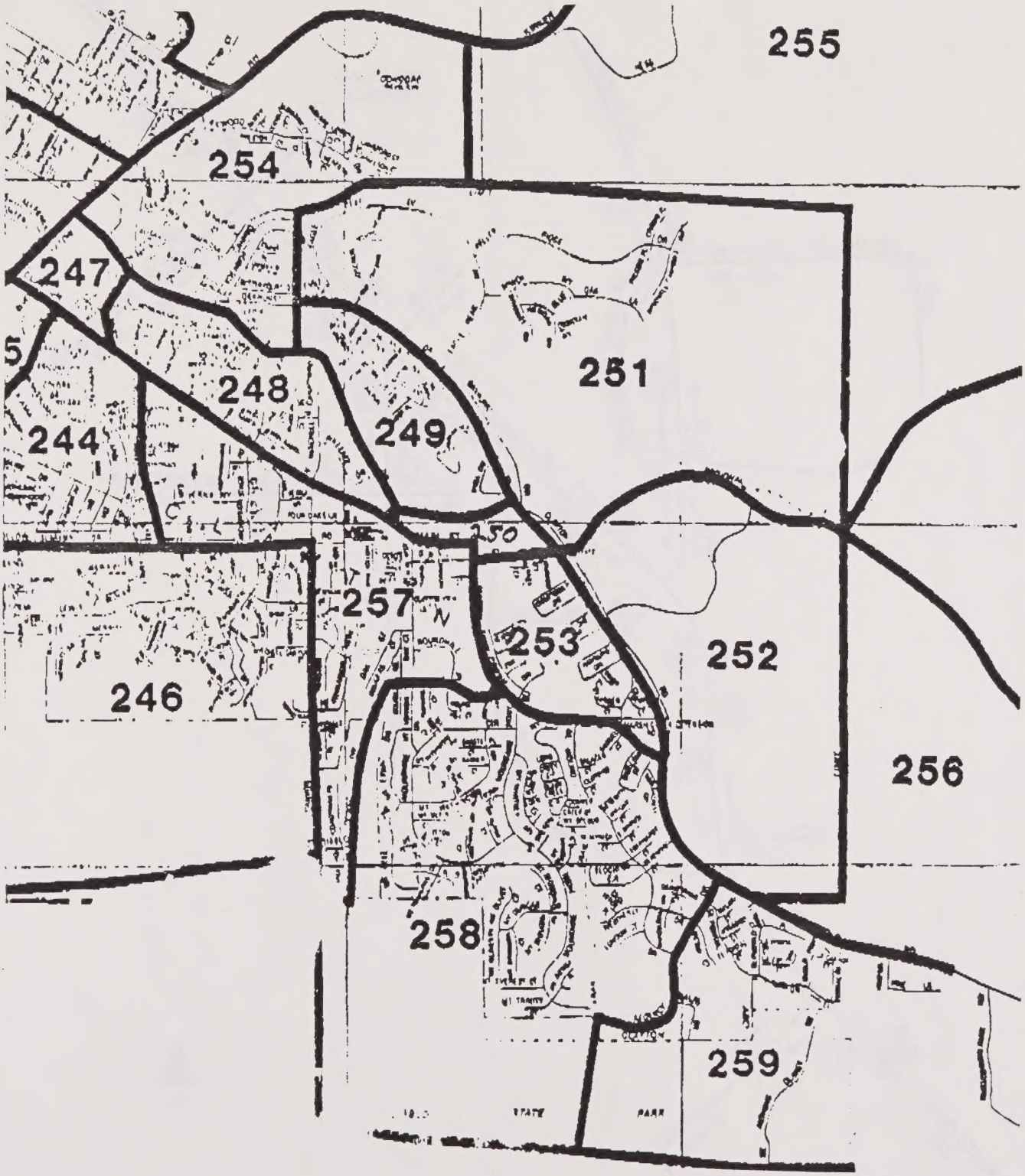
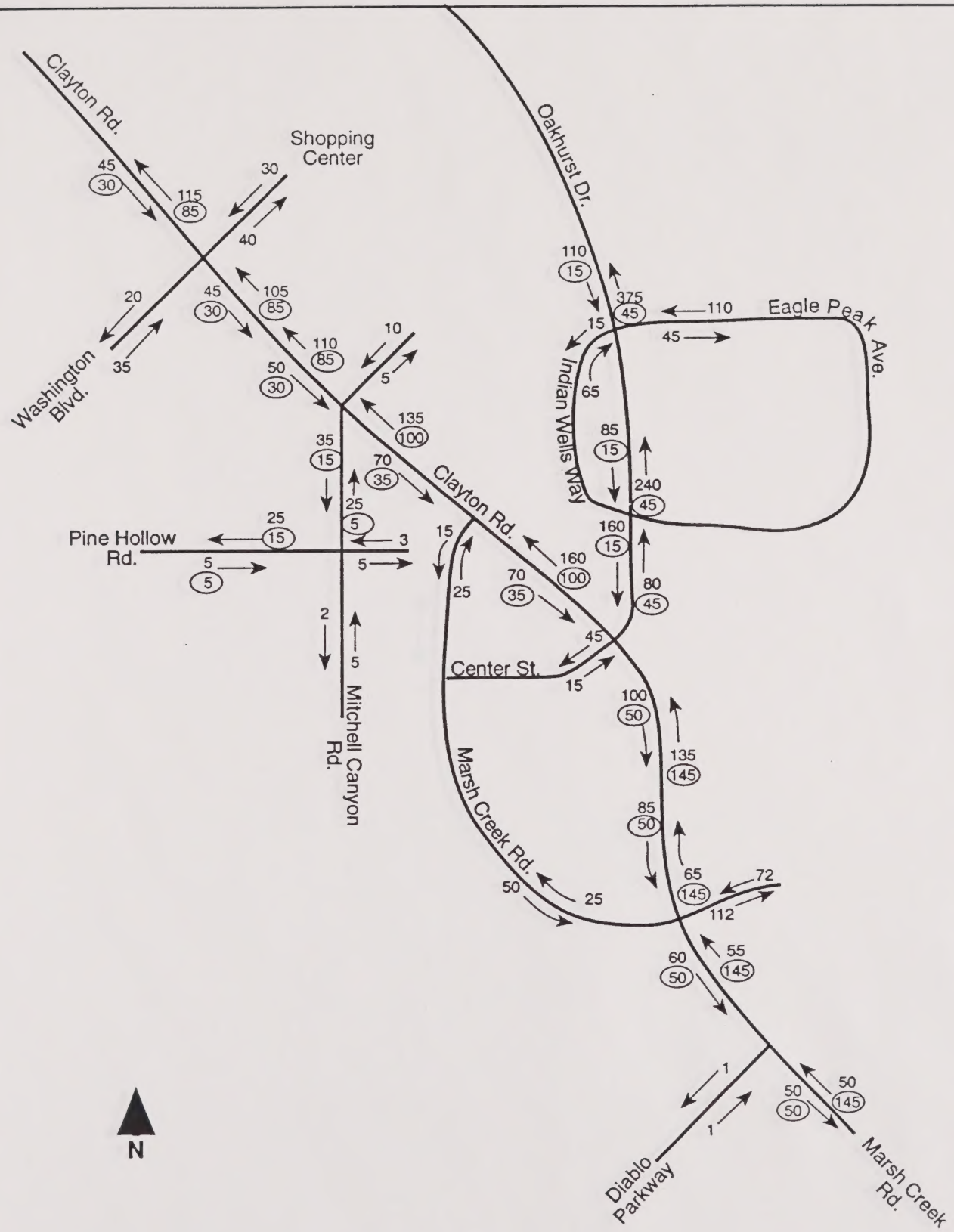



Figure 3

Survey Zones April 1991

CRANE TRANSPORTATION GROUP




XX = 1992 to 2000 Clayton Increment

(XX) = 1992 to 2000 Through Traffic Increment

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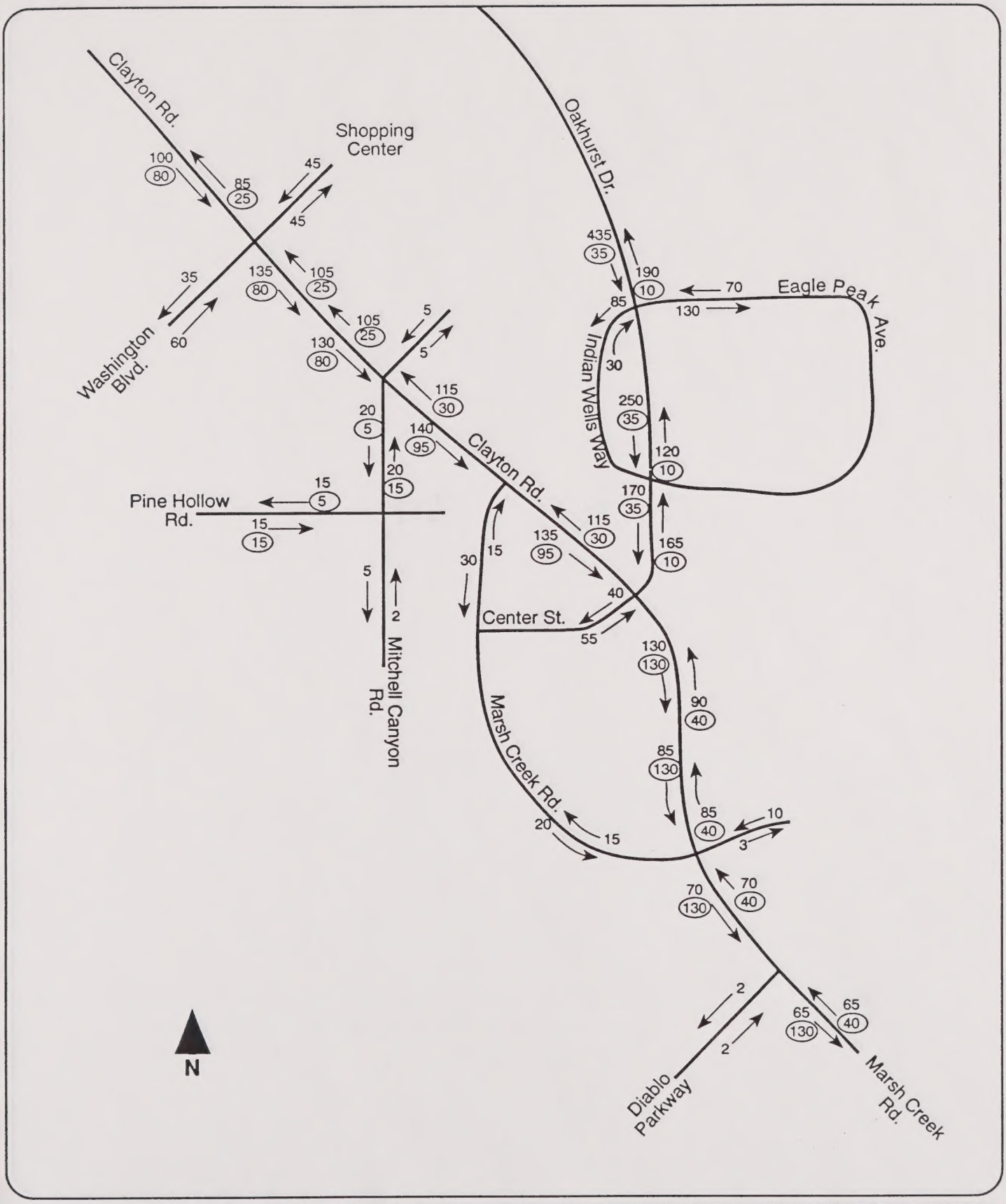
## Figure 4

**Future AM Peak Hour Trip Generation Increment—1992 to 2000 Clayton Plus Through Traffic**

City of Clayton Measure "C" Traffic Study




XX = 1992 to 2000 Clayton Increment

(XX) = 1992 to 2000 Through Traffic Increment

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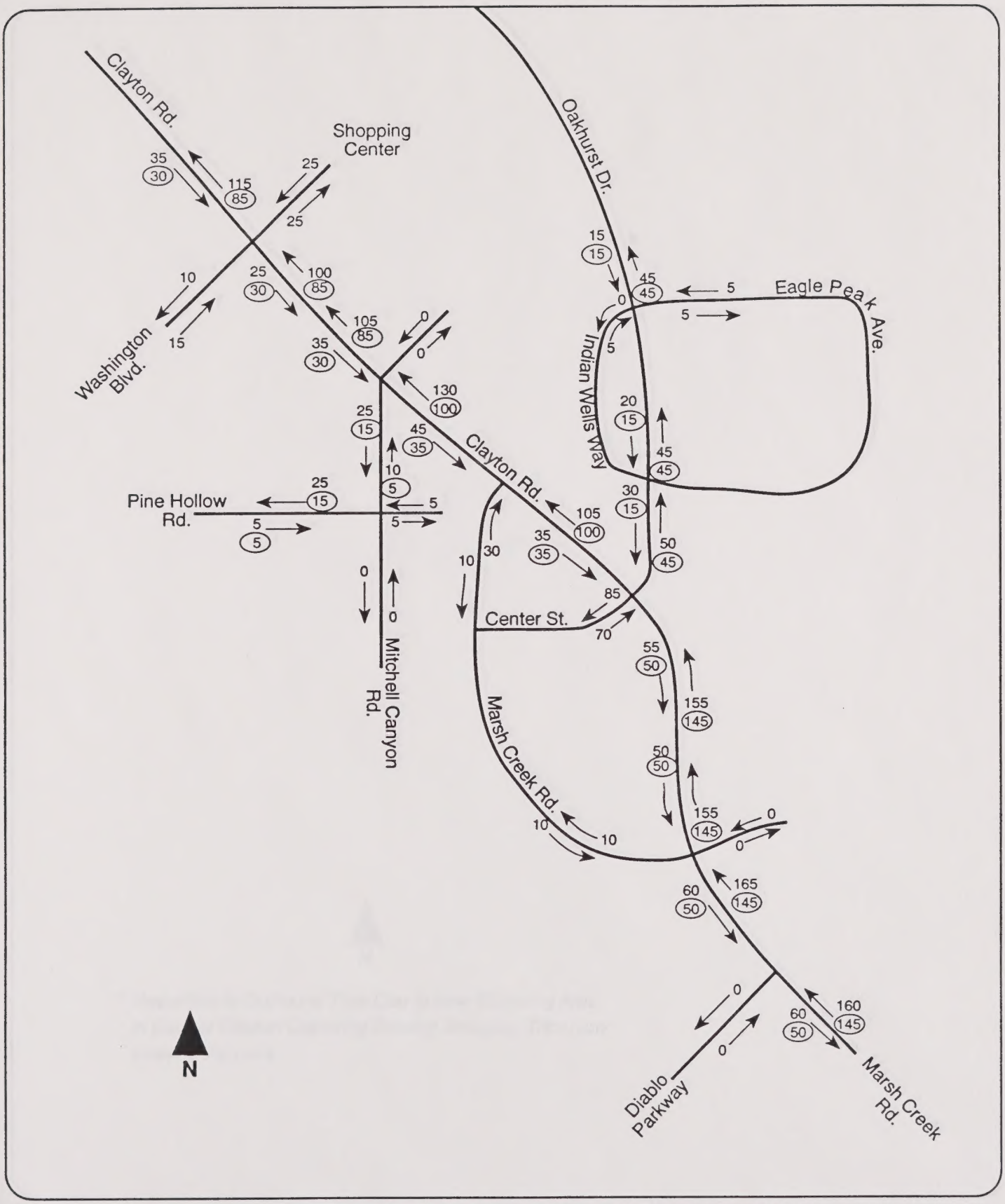
## Figure 5

**Future PM Peak Hour Trip Generation Increment—1992 to 2000 Clayton Plus Through Traffic**

City of Clayton Measure "C" Traffic Study




XX = 2001 to 2010 Clayton Increment
(XX) = 2001 to 2010 Through Traffic Increment

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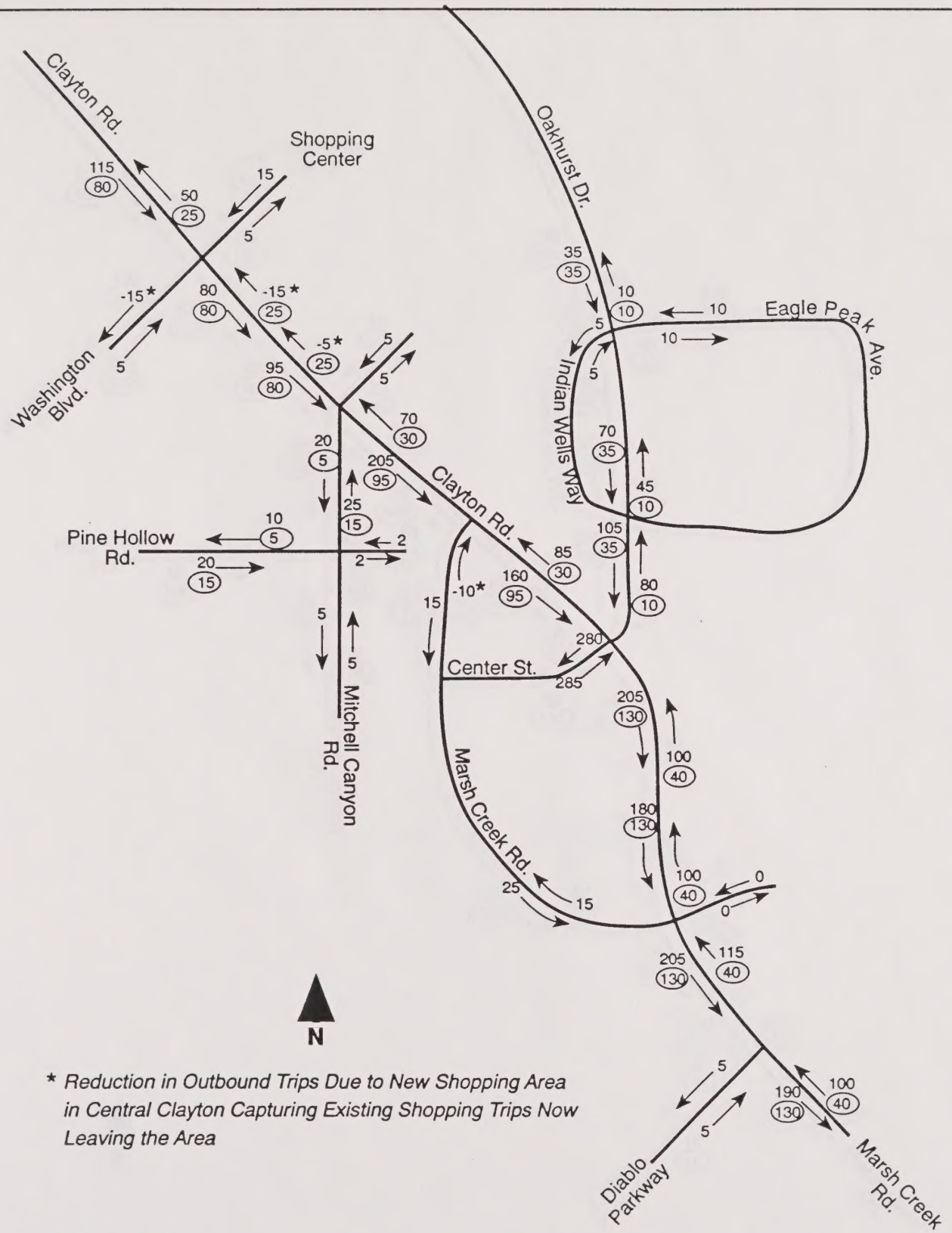
## Figure 6

**Future AM Peak Hour Trip Generation Increment—2001 to 2010 Clayton Plus Through Traffic**

City of Clayton Measure "C" Traffic Study




* *Reduction in Outbound Trips Due to New Shopping Area in Central Clayton Capturing Existing Shopping Trips Now Leaving the Area*

XX = 2001 to 2010 Clayton Increment
(XX) = 2001 to 2010 Through Traffic Increment

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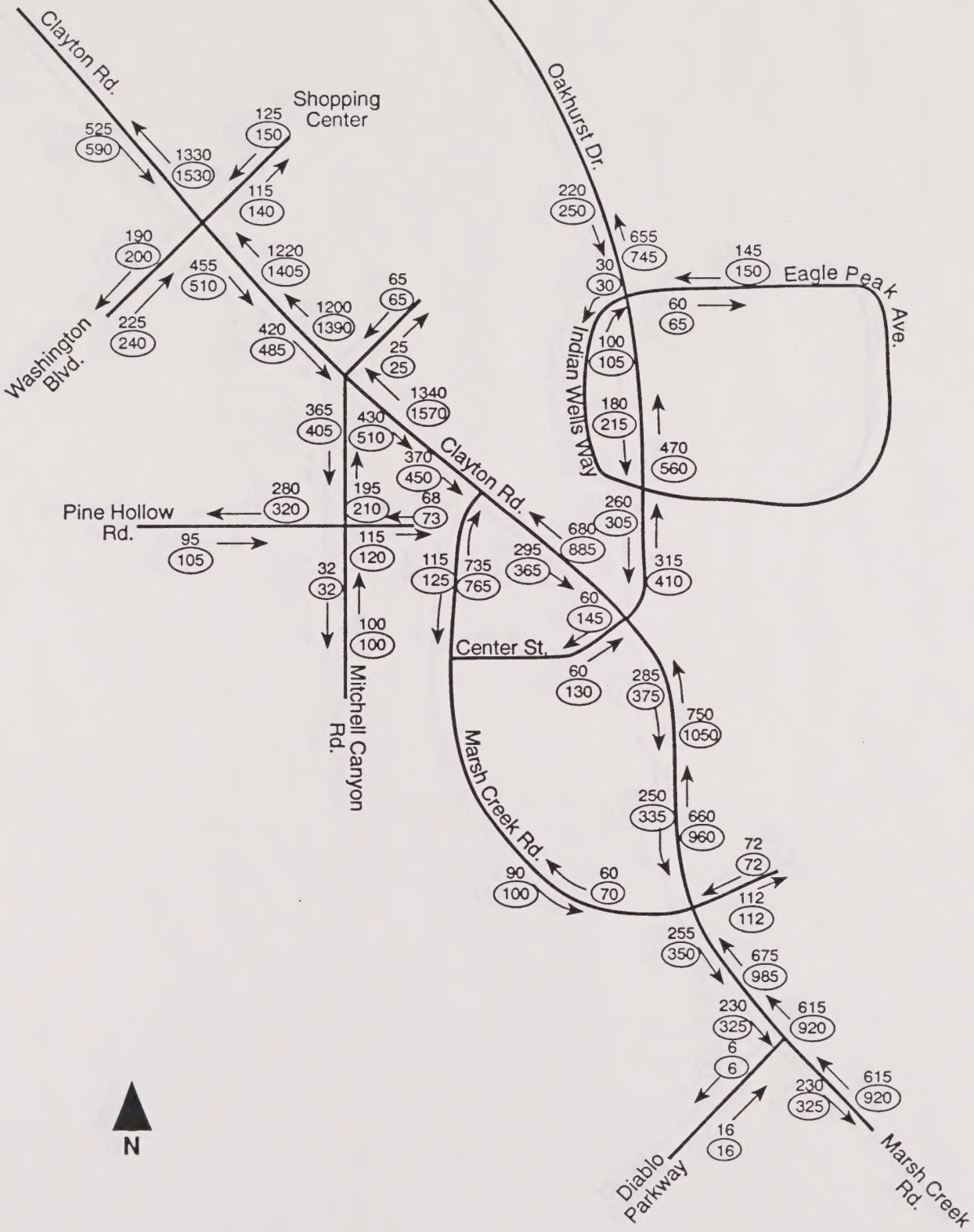
## Figure 7

**Future PM Peak Hour Trip Generation Increment—2001 to 2010 Clayton Plus Through Traffic**

City of Clayton Measure "C" Traffic Study




XX = Year 2000 Horizon
(XX) = Year 2010 Horizon

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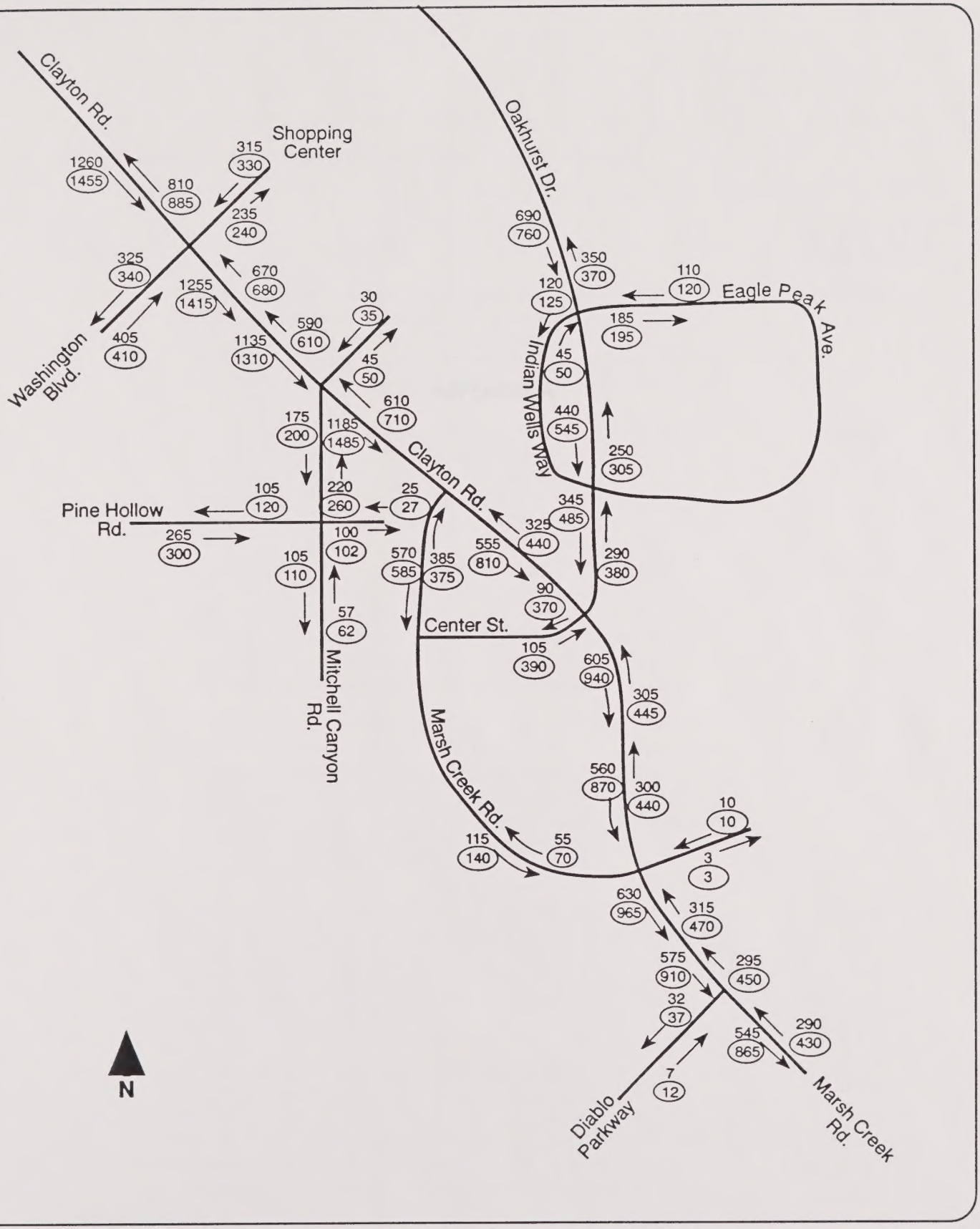
## Figure 8

**AM Peak Hour Total Volumes: Year 2000 and 2010 Horizons**

City of Clayton Measure "C" Traffic Study




XX = Year 2000 Horizon
(XX) = Year 2010 Horizon

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## Figure 9

**PM Peak Hour Total Volumes: Year 2000 and 2010 Horizons**

City of Clayton Measure "C" Traffic Study

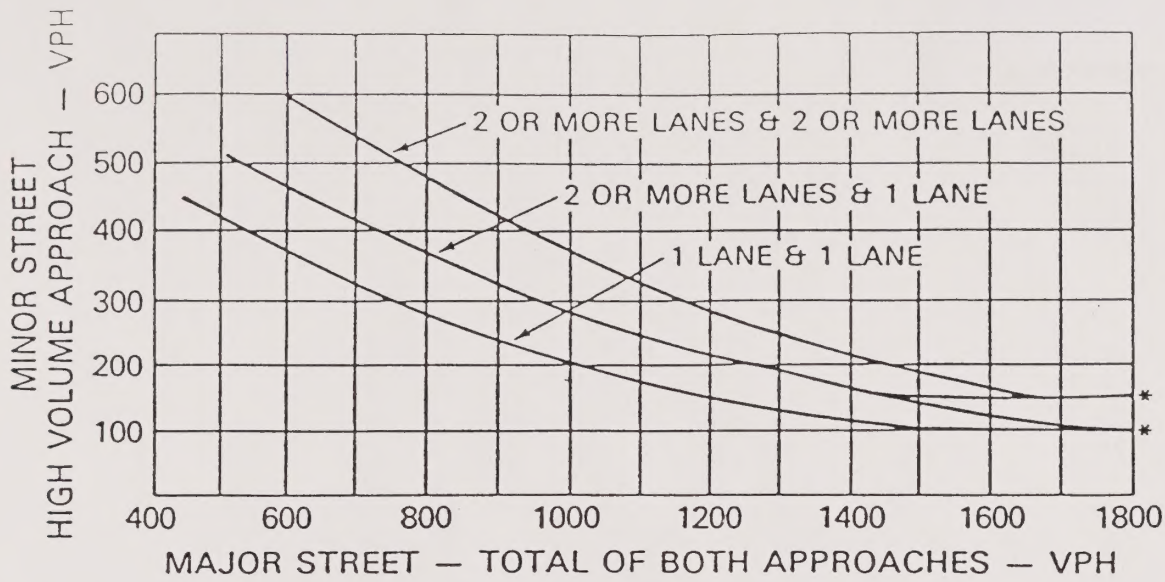
# APPENDIX A

**SIGNALIZED INTERSECTION LEVEL OF SERVICE DEFINITIONS**

| Level of Service | Description | Volume/Capacity (V/C) Ratio/a/ |
|---|---|---|
| A | Level of Service A describes a condition where the approach to an intersection appears quite open and turning movements are made easily. Little or no delay is experienced. No vehicles wait longer than one red traffic signal indication. The traffic operation can generally be described as excellent. | 0.00-0.60 |
| B | Level of Service B describes a condition where the approach to an intersection is occasionally fully utilized and some delays may be encountered. Many drivers begin to feel somewhat restricted within groups of vehicles. The traffic operation can generally be described as very good. | 0.61-0.70 |
| C | Level of Service C describes a condition where the approach to an intersection is often fully utilized and back-ups may occur behind turning vehicles. Most drivers feel somewhat restricted, but not objectionably so. The driver occasionally may have to wait more than one red traffic signal indication. The traffic operation can generally be described as good. | 0.71-0.80 |
| D | Level of Service D describes a condition of increasing restriction causing substantial delays and queues of vehicles on approaches to the intersection during short times within the peak period. However, there are enough signal cycles with lower demand such that queues are periodically cleared, thus preventing excessive back-ups. The traffic operation can generally be described as fair. | 0.81-0.90 |
| E | Capacity occurs at Level of Service E. It represents the most vehicles that any particular intersection can accommodate. At capacity there may be long queues of vehicles waiting up-stream of the intersection and vehicles may be delayed up to several signal cycles. The traffic operation can generally be described as poor. | 0.91-1.00 |
| F | Level of Service F represents a jammed condition. Back-ups from locations downstream or on the cross street may restrict or prevent movement of vehicles out of the approach under consideration. Hence, volumes of vehicles passing through the intersection vary from signal cycle to signal cycle. Because of the jammed condition, this volume would be less than capacity. | 1.01+ |

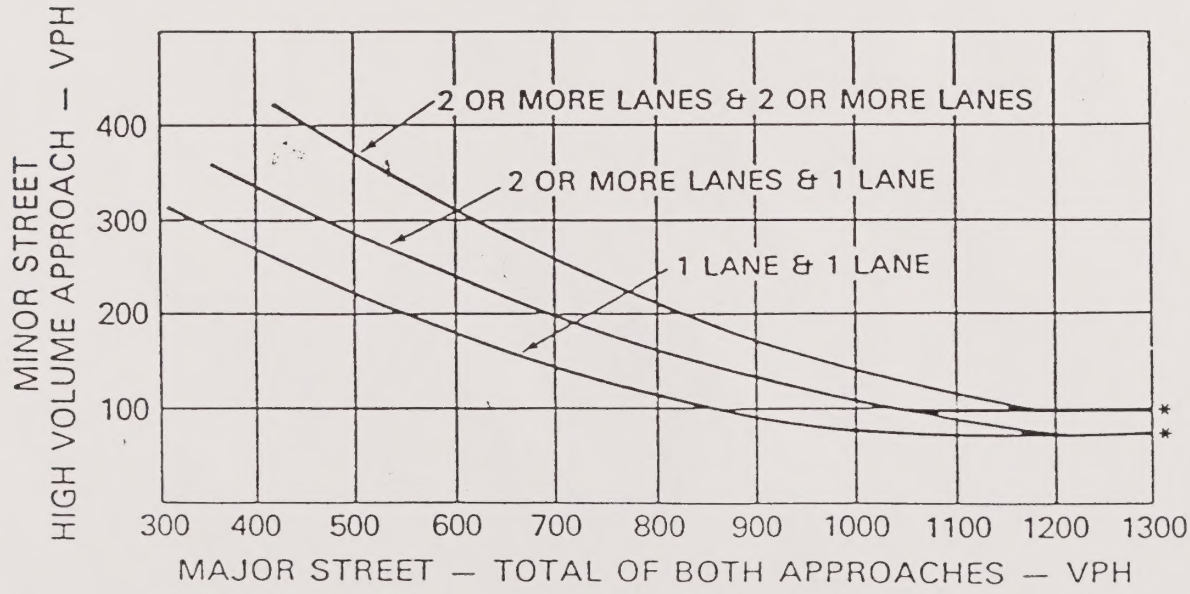
/a/ Capacity is defined as Level of Service E.

SOURCE: Highway Research Board, Highway Capacity Manual, Special Report 87, 1965




*NOTE: 150 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

**(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 40 MPH ON MAJOR STREET)**




*NOTE: 100 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACH WITH TWO OR MORE LANES AND 75 VPH APPLIES AS THE LOWER THRESHOLD VOLUME FOR A MINOR STREET APPROACHING WITH ONE LANE.

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